Edison Lamp Works

of General Electric Company

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LIGHT FOR THE CLOTHING INDUSTRY

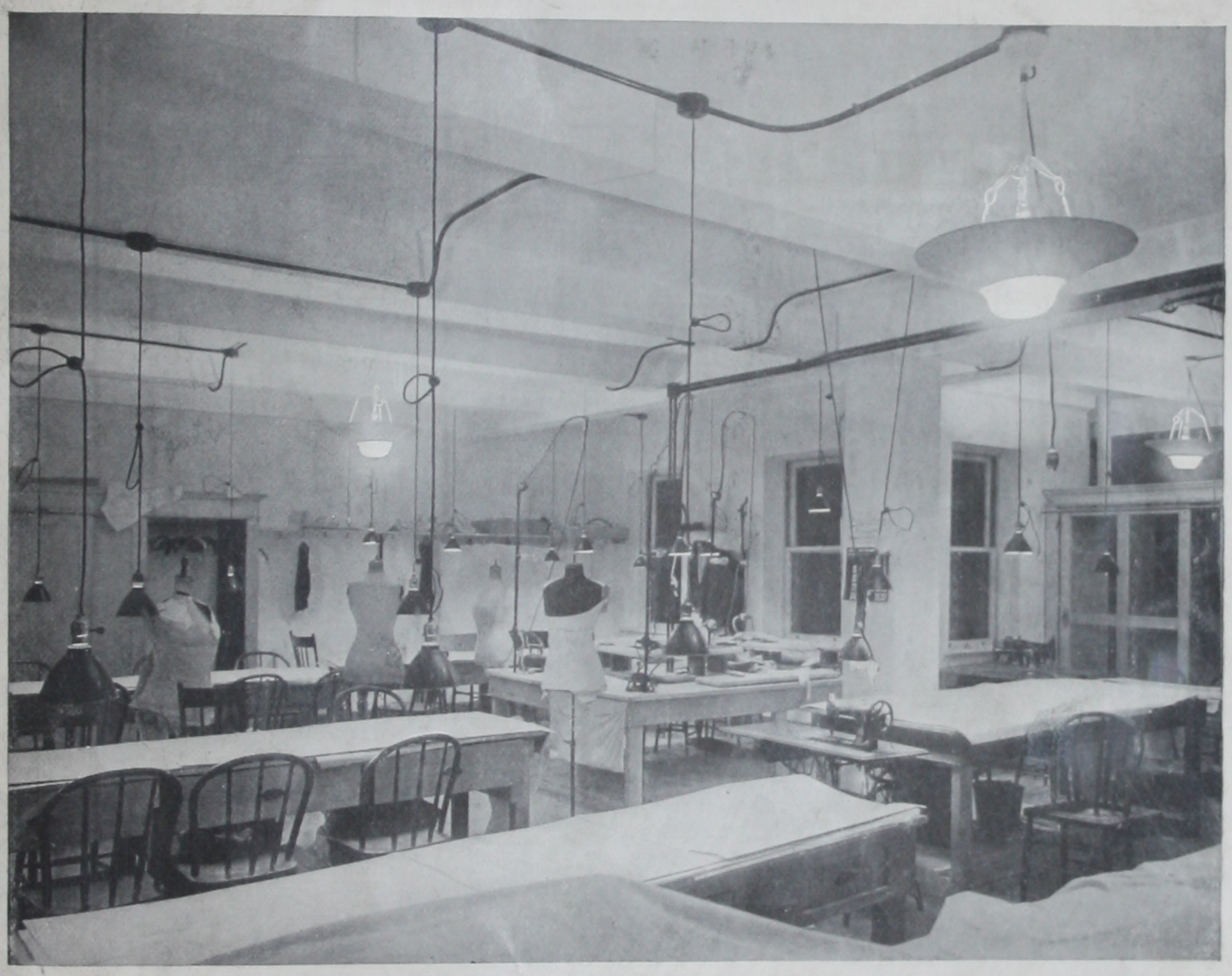

Fig. 1. NIGHT VIEW OF THE CUTTING AND PRESSING TABLES IN A VERY HIGH-GRADE LADIES' DRESSMAKING ESTABLISHMENT. A COMBINATION OF LOW INTENSITY GENERAL ILLUMINATION FROM 150-WATT CLEAR EDISON MADZA LAMPS IN SEMI-INDIRECT FIXTURES AND LOCALIZED LIGHTING FOR THE TABLES IS EMPLOYED. THESE SMALLER UNITS CONSIST OF 25-WATT CLEAR EDISON MAZDA LAMPS IN DEEP BOWL STEEL REFLECTORS GIVING AN INTENSIVE DISTRIBUTION. LAMPS ARE SO PLACED THAT THEY ARE NOT GLARING AND THE GENERAL ILLUMINATION RESULTS ARE EXCELLENT

The developments in the clothing industry in the past generation have been little short of marvelous. It is not so very long ago that entire garments were completely produced in the household, from the very shearing of the domestic sheep to the fitting and sewing by hand of the article of apparel.

The appearance of automatic machines for spinning and weaving was followed by the sewing machine. At this stage of the art material was purchased by the housewife, and the clothes made at home. Even the commercial manufacture of clothing was conducted along similar lines, sewed on machines driven by foot-power. It was

not until the introduction of the power drive, either electric or from shafting, that the huge clothing manufacturing concerns of the present day had their inception.

With the grouping of large numbers of persons in factories the question of adequate artificial lighting became of much importance. In the home the machine or worktable could be placed near the window where good natural lighting was available; in the large shop, obviously, everyone cannot be so situated.

Fortunately, however, paralleling the advance of the clothing industry have come improvements in lighting, culminating in the present day Edison Mazda lamps and accessories. Since the development of these units they have been almost universally adopted for the solution of lighting problems of industrial plants. By applying these lamps in their various sizes with suitable reflectors, it is now possible to illuminate a factory so that night work may be carried on with practically as high a degree of efficiency as is maintained during the daylight period.

As the matter is given more thought the managements of industrial corporations realize more keenly than ever before that it is necessary to maintain the human element in the industrial system at its maximum efficiency. It is very essential to observe economy of material and conservation of coal. All of these factors are coupled with a demand for increased output.

Economic conditions are such that shops must operate at full capacity and cannot cease work when natural light fails. The

Fig. 2. NIGHT VIEW OF THE CUTTING ROOM IN A LARGE CLOAK AND SUIT HOUSE. GENERAL ILLUMINATION ALONE IS PROVIDED. 300-WATT EDISON MAZDA C-2 LAMPS IN OPALESCENT DIFFUSING GLOBES ARE PLACED ONE IN THE CENTER OF EACH BAY. UNIFORM DIFFUSED LIGHTING OF A COLOR WHICH APPROXIMATES SUNLIGHT IS PROVIDED THROUGHOUT

lighting system is a most important part of plant equipment. This does not mean that it is only necessary to have some lamps hung haphazardly around the shop, but the most economical illuminant should be employed. The lamp or light source should be properly equipped and placed in the correct position. An attempt is made in this publication to give a few hints on modern methods of lighting.

have a thoroughly modern and adequate lighting installation.

Relation of Lighting to Conservation of the Employee

No one needs to emphasize the absolute necessity of protecting the eyesight of the worker. If sufficient illumination is not provided the eyes are continually subjected to a strain in their attempt to discern detail.

Fig. 3. THE APPEARANCE BY NIGHT OF A ROOM WHERE SEWING IS DONE ON LIGHT COLORED GOODS. 40-WATT EDISON MAZDA LAMPS ARE USED IN DEEP BOWL STEEL REFLECTORS PLACED AS DESCRIBED IN THE TEXT, ALTHOUGH NO LIGHT SOURCES ARE VISIBLE, SUFFICIENT LIGHT IS REFLECTED UPWARD SO THAT THE ENTIRE ROOM APPEARS BRIGHT AND CHEERFUL

In a number of states the Departments of Labor have been empowered to adopt regulations regarding industrial lighting, this action being in keeping with the general spirit of protecting the worker. In such states as already have these codes it is essential to comply with the law. In other localities, pride in one's shop and thoughtfulness of the operators' health should be sufficient to cause the owner to

This rapidly fatigues, lowers the bodily efficiency, and may produce permanent injury. Even with plenty of light, if brilliant light sources are permitted to be in the field of view, bad conditions exist. The glare from such objects affects vision.

The likelihood of demoralizing accidents is minimized if adequate lighting is provided. All moving parts can be plainly seen, and there is an absence of dense

shadows which hide objects over which one might stumble. Of the numerous safety devices available, probably no single one is as important as lighting.

Economy of Material

In the clothing industry, particularly in cutting, a slip may mean a loss of many yards of cloth. It has been proven, without a doubt, that with plenty of light spoilage is minimized.

Conservation of Coal

Although many persons may not realize it, all lamps are not equally efficient. Some give over six times the amount of light for a given quantity of energy or power than others. Of this, more later.

It is also necessary to direct the light by means of reflectors if we are to get the maximum light on the work from a given size lamp.

Consideration of these two factors will very often materially reduce the amount of power required to light a room effectively, and this, of course, means a saving of coal.

Increased Output

It is quite obvious that if conditions are such that operators can work effectively at all times, the output will be increased. If spoilage is reduced; if no time is lost fumbling around in the dark for something which one has dropped; if one can work confidently ahead, seeing what he is doing constantly; then he will speed up production.

Assistance in Securing Help

It has been demonstrated with absolute certainty that everyone prefers a cheerful, clean, well-lighted room as a place to work. If your shop is well lighted it will perforce be clean and will become a veritable magnet in attracting help.

Cost of Good Lighting

It is quite apparent that with the improvements in lamp efficiencies the cost of lighting has materially diminished. It is of interest to analyze the proportion of cost of lighting to cost of labor, neglecting other items, such as overhead charges. Data from a number of investigations have indicated that a completely modern lighting system costs to operate something less than one per cent of the cost of labor. The cost of good lighting against inadequate lighting is of course, less than this. Suppose, therefore, that a man can save one per cent of his time through having sufficient illumination on his work—then the cost is offset. It is doubtful if anyone will question this figure, but will, no doubt, agree that more than one per cent of his time could be saved. Hence the expense of illumination is transferred from the liability side of the ledger and becomes an absolute asset.

In brief, the advantages of Mazda lamps for industrial lighting are as outlined below:

Adaptability to Various Classes of Service

It would be difficult to obtain a unit with greater adaptability than the Mazda incandescent lamp, for, with the range of sizes that are available (which may be used with the different scientifically designed reflectors), practically any desired intensity, quality, or distribution of light can be obtained. A lamp, when equipped with one type of reflector, may be used to illuminate a large area to a low intensity, or, when equipped with a different type, will illuminate a small area to a high intensity. Still a different type of reflector will give light from an angle and illuminate a vertical surface.

All of these distributions, as well as a variation between them, may be obtained, showing conclusively that the Mazda lamp is far beyond the reach of other illuminants from the standpoint of flexibility.

Economy

From the standpoint of economical operating costs, which are of primary importance in all industrial plants, the arguments are all in favor of the Mazda lamp as a light source, for no other illuminant can supply satisfactory illumination with as great a degree of economy.

Effect of Voltage Variation

The voltage variation or fluctuation within moderate limits does not produce any serious effect on an installation of Mazda lamps.

This does not mean that such a condition is desirable, but when compared with the effects on other electric illuminants the bad effects are neglible. It is, however, advisable to segregate the lighting and power circuits as the best results will be obtained if constant voltage is maintained on the lighting circuit.

Fig. 4. THE COMBINATION OF LOCAL SEWING MACHINE LIGHTING AND A FAIRLY HIGH INTENSITY OF GENERAL ILLUMINATION. THE LINE OF CONDUIT SUPPORTING THE SMALL LAMPS CAN BE SEEN RUNNING THE LENGTH OF THE TABLE. FOR THE GENERAL ILLUMINATION OF THIS CLOTHING FACTORY 500-WATT EDISON MAZDA C LAMPS ARE SPACED ON 24-FT. CENTERS. THEY ARE EQUIPPED WITH OPALESCENT ENCLOSING GLOBES AND ENAMEL STEEL REFLECTORS HUNG 14 FEET IN CLOSING GLOBES AND ENAMEL STEEL REFLECTORS HUNG 14 FEET ABOVE THE FLOOR. ABSENCE OF SHADOWS AND SOFTNESS OF ILLUMINATION ARE PREDOMINATING FEATURES

Adaptability to Circuits

The Mazda lamp operates equally well on direct and alternating current. Mazda lamps are available for either 105/125 or 210/250-volt systems. It is, however, advisable to use the lower voltage system wherever possible, as lamps of this type represent a lower inital outlay, operate at a somewhat higher efficiency, and are in general of more uniform quality.

Types of Mazda Lamps

There are available many sizes and types of Mazda lamps. Those especially well suited to industrial lighting are listed on page 15. Although there is this wide range to choose from, in designing a lighting system it is usually well to confine the number of sizes and types used in a plant to a minimum. This simplifies the problem of surplus stock of lamps.

Mazda B

The earlier forms of the Mazda lamps had a filament which was rather fragile. This was soon replaced by a filament of drawn tungsten wire carefully wound about a flexible spider for support which made a very strong lamp. These lamps burn the filament in a vacuum, and to distinguish this form from other de-

signs, it is known as the Mazda B. This construction is now employed for only the smaller sizes.

Mazda C

It was later discovered that by curling the drawn wire filament into a continuous helix or spiral of small diameter and introducing an inert gas, such as nitrogen, into the bulb, a much more efficient lamp of the larger sizes could be produced. This type is designated as Mazda C.

Mazda C-2

While the color of light from the Mazda lamp is perfectly satisfactory for all ordinary uses, it is well recognized that there is a preponderance of red and yellow rays. This is not the best condition for color comparisons. If the Mazda C filament is placed in a specially determined bluish glass bulb the light is filtered or modified to approximate daylight color. Such lamps find wide application in places where color comparisons are essential. This type of illuminant is known as the Mazda C-2.

Life

The average rated life of the Mazda B and Mazda C lamps is 1000 hours. The Mazda C-2, operating at a higher efficiency to produce the whiter light, has a somewhat shorter life. By life we mean that a group of lamps will burn on a circuit of their label voltage maintaining an average life of at least 1000 hours with a decrease in candle power not greater than twenty per cent.

Fig. 5. THE USE OF 40- AND 60-WATT EDISON MAZDA LAMPS IN DEEP BOWL STEEL REFLECTORS PROPERLY PLACED WITH REFERENCE TO THE WORK IS HERE SHOWN ILLUMINATING FULL-LENGTH FORMS FOR FITTING. NOTE ESPECIALLY THE GROUPING OF LAMPS ABOUT THE FITTING STAND. EVERY DETAIL IS CLEARLY VISIBLE, ENABLING THE WORK TO BE CARRIED ON WITH ACCURACY

Reflectors

A reflector is required for two purposes:

First, all commercial light sources are far too brilliant to be looked at for any length of time. The light rays must be broken up or diffused, or else the eyes protected entirely from direct light.

Second, a reflector is very necessary to send the light in certain directions, making the lighting system as efficient as possible by directing the light to the points where it is most needed.

There are standard for use in the factory a great variety of reflectors so that the type can be chosen which adequately meets any condition. It is not necessary to go to special designs to get the proper lighting effect. A number of typical reflecting equipments are pictured on page 13. Under the detailed recommendations hints are given as to the suitable type to be used in particular departments.

Arrangement of Lights

It was not many years ago that each operator had a drop or portable lamp directly over his work and under his control, with possibly a few units hung somewhat higher for general illumination. This condition was made necessary by the fact that the lamps were not efficient enough to warrant their use in such a manner that a sufficiently high intensity was provided throughout the entire plant. Now, however, the light sources are so much more efficient that it is really good practice to have general lighting rather than this system.

A shop with any considerable number of drop lights is unsightly. The cost of wiring is high, and if it is necessary to change the position of an operator there is an expense of relocating the lighting outlet. Employees are likely to change the location of lamps by tying the wire to some stationary object, a practice which is objectionable from the standpoint of safety and forbidden by the wiring codes.

Local lighting is generally objectionable as there is a great liability of glare either from the lamp filament itself or from reflections. The operator loses time shifting the light about, breakage of lamps is liable to be quite high, and there is often marked contrast between the small brightly lighted area and the rest of the room. This is not an efficient condition.

While it cannot be denied that local lighting is sometimes necessary, general illumination is now practically standard. With this system overhead units alone are used, lighting the whole room uniformly. Outlets are symmetrically spaced with regard to the rooms or bays into which the rooms are divided. Lamps are so placed that they are well out of the ordinary angle of view and equipped with reflectors to diffuse or direct the light. Lighting units should be so arranged that dense shadows are avoided, and reflectors so chosen that an approximately even distribution of light results. General illumination permits the use of larger lamps which are usually more efficient than the smaller sizes. Since fewer outlets are required the cost of wiring is reduced. The units being held well above the reach of the workmen eliminates handling and resultant breakage.

A modification of general illumination is often employed which has been termed localized general lighting. With this system units are located with reference to the work without attempting to provide even illumination over the entire floor area. Units are placed comparatively high, giving a sufficient spread of light to illuminate the less important area to a low intensity. An attempt is not made to have a symmetrical arrangement, but rather to provide the maximum intensity at important points, allowing the spread of light to take care of adjoining spaces.

From economic reasons, where a very high intensity of light is required over a small area, a local light is required. A reflector must be used on this to screen the operator's eyes and direct the light onto the working area. Wherever localized lighting is used symmetrically spaced overhead units are desirable to furnish a low intensity of general illumination, which eliminates the dark spots that exist if only localized lights were employed.

Systems of Lighting

There are three methods of supplying general illumination known as direct, semi-indirect, and totally indirect.

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With direct lighting a reflector is placed above the lamp or an enclosing globe around it, sending the larger part of the light at once to the working area.

A semi-indirect unit consists of a translucent dish, bowl, or reflector placed below the lamp, sending most of the light to the ceiling, from which it is reflected downward. A part of the light is diffused through the glass.

A totally indirect unit consists of an opaque reflector below the lamp sending all of the light to the ceiling.

Direct lighting with efficient reflectors is unquestionably the most economical of the three methods and is the system which in the past has been almost universal for industrial lighting.

As the public is becoming better informed as to the necessary qualities of lighting, such as diffusion and absence of bright light sources in the field of view, the indirect systems are coming into more prominence, even in the factory. While they are not always feasible, yet their good qualities warrant that they receive at least consideration when planning an installation.

Totally indirect lighting is probably the least likely of any to give a glaring installation. The light is usually evenly distributed and comfortable. Objections have been raised that there is a total absence of shadow, making the room appear flat. If the system is properly designed, however, this is not true.

Semi-indirect lighting is an intermediate practice; it is more efficient than totally indirect, and much better for the eye than the average direct lighting system. Semi-indirect lighting is not glaring if the proper unit is chosen; it can be made very decorative; the light is quite evenly distributed, and such shadows as are produced are very soft and do not become annoying. The fact that the place where the light originates is readily discernible has a psychological effect on the average individual, and makes many people feel more at ease under semi-indirect lighting than under totally indirect.

Color of Walls and Ceiling

With indirect or semi-indirect systems it is very essential that the ceiling be light in color, white or light cream, to secure the maximum efficiency of reflection. Even with direct lighting, as a part of the light goes upward, light ceilings are desirable. The efficiency of any lighting system, and even daylighting, thus depends, to a great extent, on the reflecting quality of the ceillng. With light colored ceilings higher illumination for the same amount of power can be obtained than with dark ceilings.

The upper part of the walls, also, should be light, as considerable light often reaches this part of the room. The lower half of the walls are not so useful in reflecting light, and it is quite often desirable to decorate this part of the room in some rather dark neutral tint, for this is in the natural field of vision and the dark dado provides space on which the eye can rest in comfort. Matt or dull finishes are generally preferable to glossy surfaces, as they avoid the possibility of annoying reflections.

Maintenance of Installation

It is evident that lamps and reflectors should be regularly washed and cleaned, for a collection of dust will lower both the output of the lamp and the reflecting ability of the reflector. The inverted bowls of the indirect systems are particularly susceptible to an accumulation of dirt. Instances have been noted where semi-indirect units have been allowed to go uncleaned for six months. Illumination readings were taken before and after cleaning the units. The results showed an increase of from 30 to 40 per cent due to cleaning. A great deal of this depreciation occurred in the first few weeks, so that for a period of about four months or so the work tables had only been receiving about 60 per cent of the light which was intended to reach them and which they could have had for no extra cost if a little attention had been paid to cleanliness. This point applies equally well to totally indirect units and shows forcibly the necessity of careful maintenance. With

direct lighting the question of cleaning is also of much importance, for while the depreciation is not as rapid it is certainly present. As an example, an opaque steel reflector which is the least susceptible to the collection of dirt and dust of any, depreciates over 10 per cent in light output in a twelve-week period, while a light density opal glass direct lighting reflector will depreciate nearly twenty-five per cent in the same period.

Fig. 6. NIGHT VIEW IN THE MANGLE ROOM OF A STEAM LAUNDRY. 100-WATT BOWL FROSTED EDISON MAZDA C LAMPS IN ENAMEL STEEL DOME-SHAPED REFLECTORS ARE USED. THE LOCATIONS OF THESE UNITS WERE CAREFULLY DETERMINED BEFORE INSTALLING SO THAT THE CORRECT DIRECTION OF LIGHT WITH ATTENDANT MINIMIZATION OF SHADOWS WAS REALIZED. A HIGH INTENSITY OF ILLUMINATION TENDS TO PREVENT IMPERFECTLY CLEANED WORK BEING PASSED BY THE INSPECTOR

Suggestions in Detail

In factories where white or light colored articles are manufactured, such as underwear, collars, shirts, etc., localized general or general illumination can be applied to practically all processes, as the light colored surfaces absorb but little light and are easily illuminated. For the manufacture of dark goods, such as cloaks, suits, hats, caps, etc., illumination of a higher intensity is necessary, due to the higher absorbing power of this class of material. More localization of units is necessary, and in cases such as cutting and sewing machine work, or for very accurate inspection, investigation has proven that localized lights are quite essential.

In general, overhead units of medium size on comparatively close spacing are preferable to the very large units and wider spacings, as the distribution will be more even and fewer objectionable shadows will result.

One point must be borne in mind in working under artificial light with colored materials of different fabrics, and that is the quality of the light. Two pieces of goods may match well under daylight and yet clash when illuminated by commercial light sources. If goods are to be worn largely in the daytime, then it is most essential that they match under natural light, and it is also desirable that they harmonize well under artificial

light. Evening gowns must appear well under artificial lighting, and it is also desirable that they match under daylight. In assembling a garment, with its trimming, braid, buttons, etc., it is most important to compare the various items under both conditions.

The Mazda C-2 lamp in many instances has been of value in clothing manufacturing. It presents colors much more nearly in their natural values than does the light from lamps with crystal or clear glass bulb. It corrects the light as much as is economically feasible for an illuminant used for general lighting. The Mazda C-2 lamp should not be used in glassware which has a yellow tint, nor for indirect lighting in rooms with yellowish ceilings, for these have a color modifying effect which defeats the very purpose for which the lamp was designed. In other words, Mazda C-2 lamps should only be used in colorless glassware and in white surroundings for the best results.

Fig. 7. SEMI-INDIRECT ILLUMINATION IS USED IN THIS SAMPLE ROOM OF A LARGE SHIRT MANUFACTURING CONCERN. AN INEXPENSIVE TYPE FIXTURE ILLUSTRATED IN DETAIL IN THIS BULLETIN, IS EMPLOYED WITH 300-WATT EDISON MAZDA C LAMPS. ONE OUTLET IS LOCATED IN THE CENTER OF EACH BAY, 20 BY 22 FEET; THE CEILING IS 13 FEET HIGH, THE AVERAGE INTENSITY OF ILLUMINATION IS SOMEWHAT OVER 4 FOOT-CANDLES

Cutting

Hand cutting is usually employed on custom-made material, and it is quite essential that strong illumination be provided on the cutting table to avoid the possibillty of errors. Any of the systems of general lighting may be employed with medium size Mazda lamps (1 to 2 watts per square foot of floor area). Some firms have found the Mazda C-2 lamp for this purpose a desirable feature on account of its improved color value.

A room devoted to machine cutting does not require as high an intensity of general illumination, for each machine has a small lamp permanently placed above the cutting tool. Here 0.2 to 0.4 watt per square foot of floor area for overhead units will be suitable.

Sewing Machines

These are usually placed at both sides of a long table with a trough between rows of

machines to receive finished work (double trough power tables). If all the manufacturing is devoted to light colored goods a localized general system of illumination proves satisfactory. A 40-watt Mazda lamp with deep bowl steel reflector should be placed over the trough midway between machines, three feet above the table. This will give the correct direction of light at the needle-point, and the machine heads will not cast objectionable shadows. The piles of light colored goods lying on the table will reflect sufficient light upward so that but very few additional units need be used for general lighting. An example of such an installation can be seen in Fig. 3.

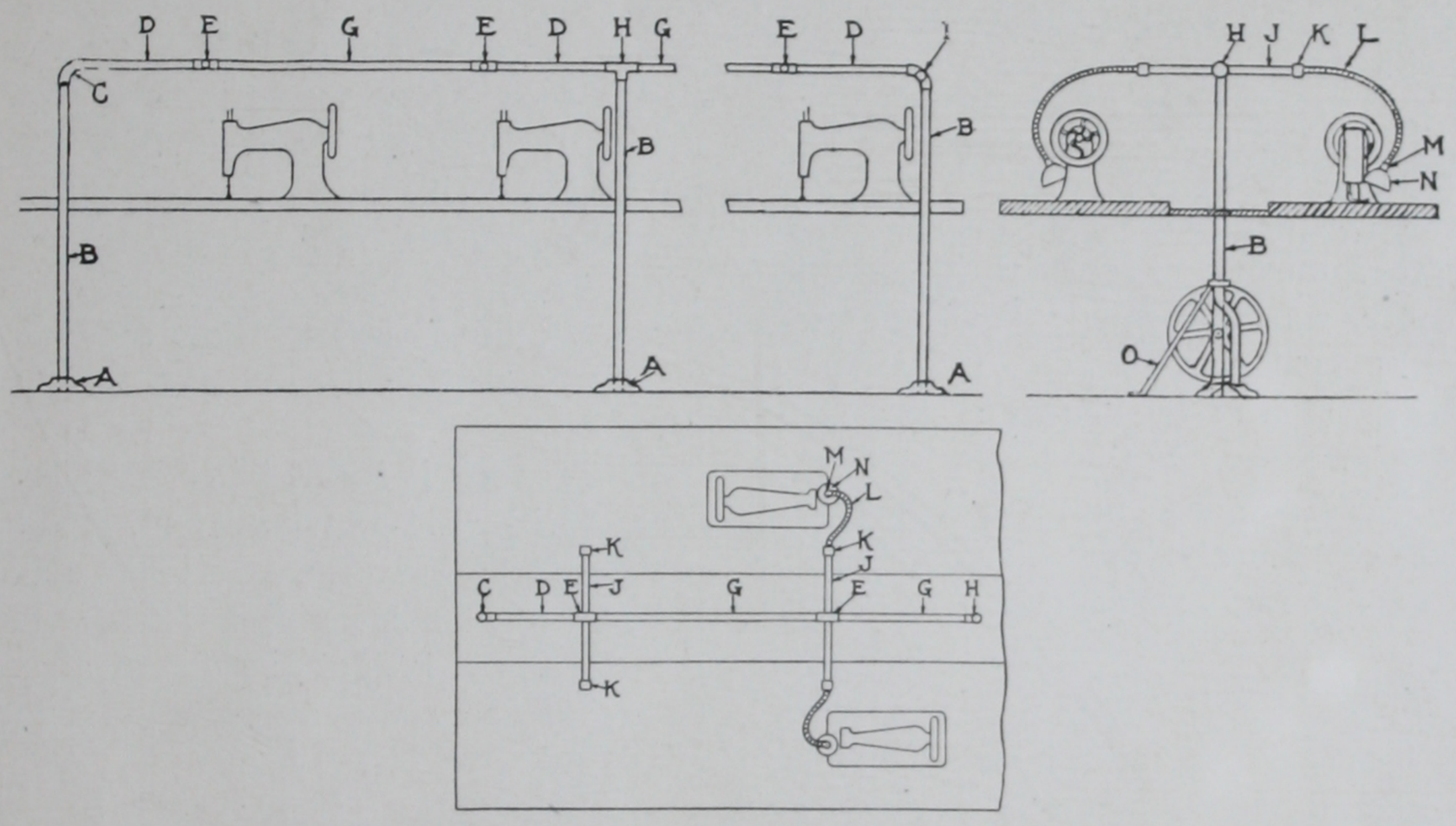


Fig. 8. PLAN AND ELEVATION SHOWING AN EXCELLENT METHOD OF MOUNTING INDIVIDUAL LIGHTS FOR A DOUBLE TROUGH POWER TABLE

For sewing on dark goods a combination of local lighting and general illumination (overhead units supplying about ½ watt per square foot of floor area) is necessary. On account of the extreme vibration of the entire table the problem of supporting small local lamps is somewhat complicated. It is, however, susceptible of solution by a number of methods. One of these is indicated in Fig. 8. It will be noted that the conduit is supported from the floor. A hole is cut through the table of such a diameter that in spite of the vibration it does not touch the supporting leg.

A complete list of the fittings necessary to equip a double trough power table of twelve machines is given below. This is based on the use of standard conduit fittings, flexible arms, a small special reflector for sewing machine lighting, shown on page 13, and standard Mazda lamps. There are many types of flexible arms on the market, or any of the patent adjustable light holders can be substituted in this bill of material for items J, K, and L.

LIST OF FITTINGS

Symbol	Description	Quantity Required
A	Floor plate for ¾-in. pipe with suitable screws	4
B	¾-in, pipe bent as indicated to clear power shaft, of such a length as to bring line about 18 in. above table.	4
C	¾-in. angle fitting	1
D	¾-in. pipe 2 ft. 8 in. long, threaded both ends	6
E	X fitting ¾ x ¾ x ½ x ½ blank metal cover	6
G	¾-in. pipe, 5 ft. 8 in. long, threaded both ends	3
H	T fitting, ¾ x ¾ x ¾ blank metal cover	2
I	Angle type fitting ¾ x ¾ with 5 amp. snap switch	1
J	½-in. pipe, 12 in. long, threaded both ends	12
K	⅜ x ½ female coupling	12
L	18-in. flexible arm	12
M	Brass shell key socket with ⅜-in. cap.	12
N	Ivanhoe metal reflector No. 634 for sewing machine lighting with 15-watt bowl frosted Mazda lamp	12
O	Strap iron brace	4

Hand Sewing

General illumination from medium size units, say 100-watt Mazda lamps, with suitable steel reflectors, should be provided in this portion of the plant. From 1 to 2 watts per square foot are necessary, the lower value being suitable where light colored goods are being manufactured, and the higher value for dark materials. It is sometimes advisable to locate the lamps with reference to the grouping of work, still hanging them sufficiently high to be out of reach.

Fitting

The fitting-room should be furnished with moderate intensity of general illumination (0.75 to 1.25 watts per square foot). In rooms where the customer receives a fitting the decorative value of the fixture may well receive consideration. In the shop, where forms are used, the standard industrial equipment is suitable. An example of this type of lighting appears in Fig. 5.

Pressing and Laundering

The localized general scheme of placing outlets should be used here so that lamps are in a correct relative position to the table and shadows avoided. One 60-watt Mazda lamp with dome-shaped steel reflector should be placed about four feet above each board.

In the laundry, with the many overhanging parts, the location of outlets is especially important. As the arrangement of machinery varies considerably in different plants, it is impossible to specify any scheme which will be universally satisfactory. Mazda C-2 lamps are especially desirable for use over the folding and inspection benches of the laundry. They will enable the operator to catch many an improperly cleaned piece, and thus keep up the standard of the work. Spots and stains on goods are usually of a brownish or yellowish tint. If the light source is rich in yellow, then these blemishes tend to fade into the white background and are hard to detect. The laundry departments of some of the largest shirt manufacturers and similar firms are using this type of lamp for their illumination.

Stock Rooms, Packing and Shipping

If the material is likely to be placed anywhere about the room with no definite arrangement, a general lighting system is suitable. The demands for illumination are not severe; merely sufficient light to see the labels and find one's way about is necessary. One unit in the center of each bay, hung close to the ceiling, will usually be adequate. The dome-shaped steel reflector gives the necessary wide spread of light. The size of Mazda lamp should be such that approximately 0.25 watt per square foot of floor area is provided.

If the stock is located in high piles or on shelves with aisles between rows, then smaller units more closely spaced will be advisable. Forty-watt Mazda lamps in bowl-shaped steel reflectors, at 10-foot intervals above the center of the aisles are often satisfactorily employed.

Sample and Show Rooms

The decorative element enters more or less into the question of lighting, and the problem is practically that of the store. General illumination of a fairly high intensity should be employed, and the indirect systems are well suited. If light goods are on display much less light is required than when men's clothing or similar articles are to be viewed. Fig. 7 represents typical practice, and the following values may be of some use as indicative of what is necessary:

	WATTS PER SQ. FT.	
	Dark Goods	Light Goods
Direct	1.5	0.75 - 1.0
Semi-indirect	2.0	1.0 - 1.5
Totally indirect	2.5	1.5 - 1.75

ENAMELED STEEL REFLECTORS

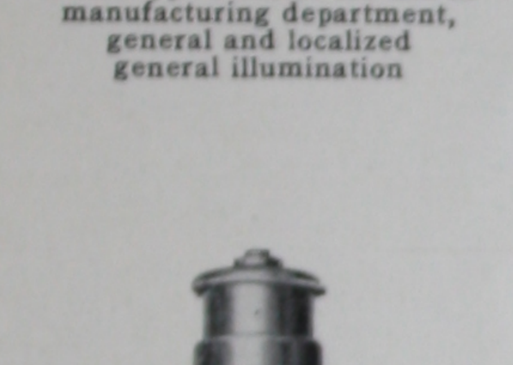
Dome type suitable for use in manufacturing department, general and localized general illumination

Angle type for lighting high bays from the sides and for producing a high component of vertical illumination

Bowl type suitable for use in manufacturing department, local lighting

Enamel steel reflector and opalescent enclosing globe. For use in manufacturing department where diffused light is desired

No. 634
Sewing Machine Reflector



Reflectocap Diffuser produces well diffused general illumination

Slightly Decorative Semi-indirect Bow

Inexpensive carefully designed semi-indirect unit

DEEP BOWL REFLECTORS FOR DIRECT LIGHTING

Prismatic

Light Density Opal

Heavy Density Opal

Medium Density Opal

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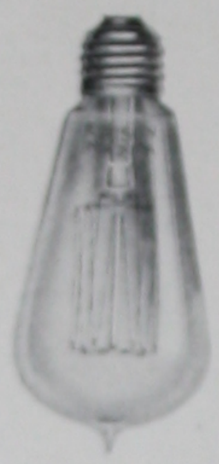
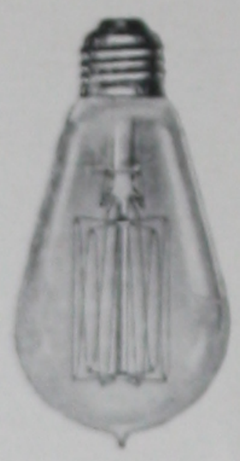
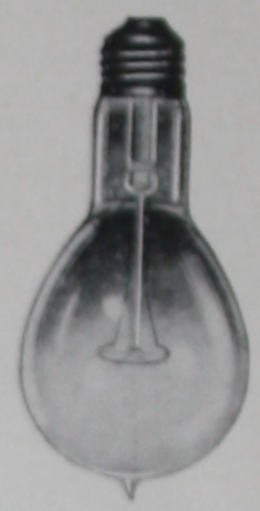
S-17 Bulb
10 and 15 Watts
105-125 Volts



S-19 Bulb
25, 40 and 50 Watts
105-125 Volts
25 and 50 Watts
210-250 Volts



S-21 Bulb
60 Watts
105-125 Volts
210-250 Volts



PS-22 Bulb
75 Watts
105-125 Volts

PS-25 Bulb
100 Watts
105-125 Volts

The 150-watt size has a filament similar to the 200-watt size rather than the ring filament as shown.

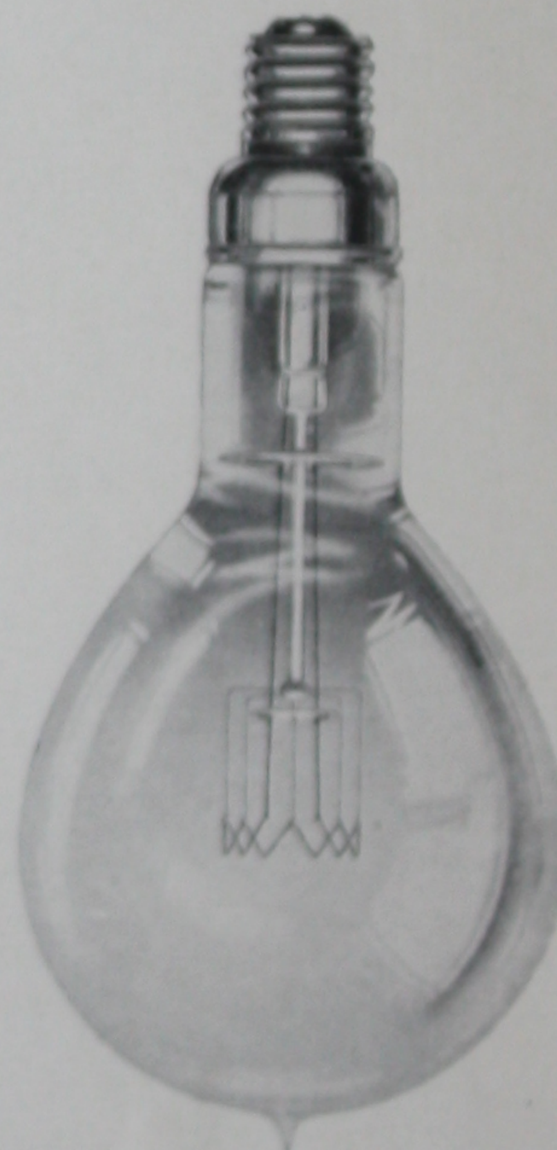
EDISON MAZDA B LAMPS

(One-quarter Size)

PS-30 Bulb
200 Watts
105-125 and
220-250 Volts

PS-35 Bulb
300 Watts
105-125 and
220-250 Volts

PS-40 Bulb
400 and 500 Watts
105-125 and
220-250 Volts



PS-52 Bulb
750 and 1000 Watts
105-125 and
220-250 Volts

EDISON MAZDA C LAMPS

(One-quarter Size)

Edison Mazda C-2 lamps are similar in appearance save for the blue bulb.

EDISON MAZDA LAMPS

EDISON MAZDA B LAMPS

Straight Side Types fitted with Medium Screw Base

Volts	Size of Lamps in Watts	Total Lumens	Size and Type of Bulb	Diam. in In.	Over-all Length in In.	Std. Pkg. Qty.
105 to 125	10	75	S-17	2 1/8	4 5/8	100
	15	128				
	25	230	S-19	2 3/8	5 1/4	100
	40	380				
	50	480				
	60	590	S-21	2 5/8	5 1/2	100
	100	1010	S-30	3 3/4	7 7/8	24
220 to 250	25	190	S-19	2 3/8	5 1/4	100
	50	420				
	100	900	S-30	3 3/4	7 7/8	24
	150	1420	S-35	4 3/8	8 3/4	24
	250	2620	S-40	5	10	12

EDISON MAZDA C LAMPS*

Pear-shaped Bulb, fitted with Mogul Screw Base, except 75-, 100-, 150-, and 200-watt, which have Medium Screw Base.

Volts	Size of Lamps in Watts	Total Lumens	Size and Type of Bulb	Diam. in In.	Over-all Length in In.	Std. Pkg. Qty.
105 to 125	75	865	PS-22	2 3/4	6 1/8	50
	100	1260	PS-25	3 1/8	7 1/8	24
	150	2050	PS-25			
	200	2920	PS-30	3 3/4	8 3/8	24
	300	4850	PS-35	4 3/8	9 3/4	24
	400	6150	PS-40	5	10	12
	500	8050	PS-40			
	750	12800	PS-52	6 1/2	13 3/8	8
	1000	18000	PS-52			
220 to 250	200	2520	PS-30	3 3/4	8 3/8	24
	300	4100	PS-35	4 3/8	9 3/4	24
	400	5850	PS-40	5	10	12
	500	7400	PS-40			
	750	11500	PS-52	6 1/2	13 3/8	8
	1000	16100	PS-52			

EDISON MAZDA C-2 LAMPS*

Pear-shaped Blue Glass Bulbs, 75-, 100-, 150-, and 200-watt sizes have the Medium Screw Base, while the 300- and 500-watt sizes have the Mogul Screw Base.

Volts	Size of Lamps in Watts	Total Lumens	Size and Type of Bulb	Diam. in In.	Over-all Length in In.	Std. Pkg. Qty.
105 to 125	75	600	PS-22	2 3/4	6 1/8	50
	100	870	PS-25	3 1/8	7 1/8	24
	150	1400	PS-25	3 1/8	7 1/8	24
	200	2000	PS-30	3 3/4	8 3/8	24
	300	3350	PS-35	4 3/8	9 3/4	24
	500	5600	PS-40	5	10	12

Prices and quantity discounts can be obtained from any of the district or local offices listed on the page following. Information on sign, show case, round bulb, floodlighting, and all other types of Mazda lamps can be obtained from the same source.

* Orders should specifically state if lamps are to be burned in other than pendant position.

EDISON LAMP WORKS
OF
GENERAL ELECTRIC COMPANY
GENERAL SALES OFFICE, *HARRISON, N. J.

SALES OFFICE (address nearest office):

*ATLANTA, GA.	Third National Bank Building
BALTIMORE, MD.	Munsey Building
BIRMINGHAM, ALA.	Brown-Marx Building
*BOSTON, MASS.	84 State Street
BUFFALO, N. Y.	Electric Building
BUTTE, MONT.	Electric Building
CHARLESTON, W. VA.	Charleston National Bank Building
CHARLOTTE, N. C.	Commercial National Bank Building
CHATTANOOGA, TENN.	James Building
*CHICAGO, ILL.	Monadnock Building
*CINCINNATI, OHIO	Provident Bank Building
CLEVELAND, OHIO	Illuminating Building
COLUMBUS, OHIO	Columbus Savings & Trust Building
DAYTON, OHIO	Schwind Building
*DENVER, COLO.	First National Bank Building
DES MOINES, IOWA	Hippee Building
DETROIT, MICH.	Dime Savings Bank Building
DULUTH, MINN.	Fidelity Building
ELMIRA, N. Y.	Hulett Building
ERIE, PA.	Marine Natilnal Bank Building
FT. WAYNE, IND.	1600 Broadway
INDIANAPOLIS, IND.	Traction Terminal Building
JACKSONVILLE, FLA.	Heard National Bank Building
JOPLIN, MO.	Miners' Bank Building
*KANSAS CITY, MO.	Dwight Building
KNOXVILLE, TENN.	Bank & Trust Building
*LOS ANGELES, CAL.	Corporation Building, 724 S. Spring Street
LOUISVILLE, KY.	Starks Building
MEMPHIS, TENN.	Randolph Building
MILWAUKEE, WIS.	Public Service Building
*MINNEAPOLIS, MINN.	410 Third Avenue, North
NASHVILLE, TENN.	Stahlman Building
NEW HAVEN, CONN.	Second National Bank Building
*NEW ORLEANS, LA.	Maison-Blanche Building
*NEW YORK, N. Y.	30 Church Street
NIAGARA FALLS, N. Y.	Gluck Building
OMAHA, NEB.	Union Pacific Building
*PHILADELPHIA, PA.	Witherspoon Building
*PITTSBURGH, PA.	Oliver Building
*PORTLAND, ORE.	Electric Building
PROVIDENCE, R. I.	Turks Head Building
RICHMOND, VA.	Virginia Railway and Power Building
ROCHESTER, N. Y.	Granite Building
*SALT LAKE CITY, UTAH	Newhouse Building
*SAN FRANCISCO, CAL.	Rialto Building
SCHENECTADY, N. Y.	G. E. Works
SEATTLE, WASH.	Colman Building
SPOKANE, WASH.	Paulsen Building
SPRINGFIELD, MASS.	Massachusetts Mutual Building
*ST. LOUIS, MO.	Pierce Building
SYRACUSE, N. Y.	Onondaga County Savings Bank Building
TOLEDO, OHIO	Spitzer Building
WASHINGTON, D. C.	Evans Building
YOUNGSTOWN, OHIO	Wick Building

*For Texas, Oklahoma and Arizona business refer to:

SOUTHWEST GENERAL ELECTRIC COMPANY (formerly Hobson Electric Co.)	
DALLAS, TEXAS	1701 N. Market Street
EL PASO, TEXAS	500 San Francisco Street
HOUSTON, TEXAS	Third and Washington Streets
OKLAHOMA CITY, OKLA.	Insurance Building

*Stock of lamps at these points.

EDISON LAMP FACTORIES

HARRISON, N. J.	NEWARK, N. J.
EAST BOSTON, MASS.	LYNN, MASS.
FT. WAYNE, IND.	AMPERE, N. J.

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